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IS 11662 (1986): Preservative Treatments of Textiles [TXD
7: Textile Sizing and Finishing Materials]



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IS : 11662 - 1986

Indian Standard
SPECIFICATION FOR
PRESERVATIVE TREATMENTS OF TEXTILES
(First Reprint JULY 1993)

UDC 677.027.625.3

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BUREAU OF INDIAN STANDARDS
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Gr 7

March 1987

AMENDMENT NO. 1 DECEMBER 1999
TO
IS 11662 : 1986 SPECIFICATION FOR
PRESERVATIVE TREATMENTS OF TEXTILES

(*Page 10, clause 4.7.3*) — Substitute the following for the existing:

4.7.3 Amount of Preservative Agent

- a) *Light process* — The pentachlorophenyl laurate content of treated textile shall be not less than 1.0 percent nor more than 1.7 percent when tested by the method prescribed in 10 of IS 3522 (Part 2) : 1989*.
- b) *Normal process* — The pentachlorophenyl laurate content of the treated textile shall be not less than 1.7 percent nor more than 2.5 percent [see 10 of IS 3522 (Part 2) : 1989*] unless the textile being treated is sewing thread or pressed wool felt in which case the upper limit shall be 3.5 percent
- c) *Pentachlorophenyl (PCP) content* — In neither case the free PCP content of the treated textile shall exceed 10 percent of the pentachlorophenyl laurate content.'

[*Page 10, clause 4.8.2 (d)*] — Insert the following footnote after the clause:

*Estimation of common preservative, Part 2

(*Page 11, clause 4.8.3.1*) — Substitute 'Appendix C' for 'Appendix D'.

(*Page 23, APPENDIX C*) — Delete.

(*Page 25, APPENDIX D*) — Renumber 'APPENDIX D' as 'APPENDIX C' and renumber the clauses accordingly.

(TX 07)

Indian Standard

SPECIFICATION FOR PRESERVATIVE TREATMENTS OF TEXTILES

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Indian Standard
**SPECIFICATION FOR
PRESERVATIVE TREATMENTS OF TEXTILES**

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 April 1986, after the draft finalized by the Textile Sizing and Finishing Materials Sectional Committee had been approved by the Textile Division Council.

0.2 During storage or in use, most of the textile materials are liable to suffer damage as a result of attack by bacteria, fungi or moulds. Numerous treatments have been developed for textile materials with different preservatives (fungicides or insecticides) commonly known as rot proofing or mothproofing agents to protect the materials from staining and degradation arising from attack and growth of micro-organisms under adverse conditions of temperature and humidity and other influences like sunlight and weathering.

0.3 At present no treatment is known which imparts complete protection nor which is without some disadvantage. The degree of damage by micro-organisms depends upon the intrinsic properties of the textile material, the conditions of use or storage, and upon the nature of preservative treatment applied to them. The preservative treatments included in this standard are expected to find general acceptance by textile finishers and proofers.

0.4 Although the standard specifies the individual treatment, it may sometimes be advantageous to apply two or more treatments provided they are mutually compatible and are acceptable to the purchaser. Appendix A gives guidelines for selection of treatments based on the experience in use and the properties of these treatments. The information given may not be generally applicable in all cases, and the greatest care should be exercised in interpreting the notes given in Appendix A because of the variation in characteristics and properties between one textile material and another, and the differences in behaviour they may show even under similar conditions. It is very essential to keep in mind the possibility of adverse interactions between the treated textile and other materials in contact. Table 3 of Appendix A gives the guidelines for selection of processes for various preservative treatments.

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0.5 Most of the preservative processes or chemicals have toxic properties in some measure and should be handled with care. Appendix A, Table 3 gives information on some of the known hazards and on precautions which should be taken with specific agents.

0.6 Considerable assistance has been taken for preparation of this standard, from BS 2087 : Part 1 : 1981 'Preservative treatments for textiles: Part 1 Specification for treatments', issued by the British Standards Institution.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies treatments (that is, agents, their application and levels) of common preservatives used in textile industry for protection against one or more causes, namely, attack by fungi, bacteria and insects, and degradation caused by the action of weathering and sunlight.

1.2 The materials and processes have been divided into two classes. Class A processes have been generally accepted. Class B processes, although of recognized merit in certain restricted fields, are not yet sufficiently accepted for textiles to warrant inclusion in Class A. Class A includes the following processes:

- a) Zinc naphthenate process,
- b) Copper naphthenate process,
- c) Cuprammonium process,
- d) Mineral khaki process,
- e) Chrome tinting process,
- f) Salicylanilide process,
- g) Pentachlorophenyl laurate process,
- h) Copper 8 process,
- j) Dichlorophen process,
- k) Tar oils process,
- m) Dieldrin process, and
- n) Halogenated diphenyl urea derivative process.

*Rules for rounding off numerical values (*revised*).

Class B includes the following processes:

- a) Tributyltin oxide process,
- b) Orthophenyl phenol (OPP) process, and
- c) Pentachlorophenol process.

2. GENERAL REQUIREMENTS

2.1 Choice of Treatment

2.1.1 When the textiles are required to be treated with one or more processes in accordance with this standard, the order or contract shall specify by name, which protective treatment(s) shall be applied. Some of the processes referred to in this standard include more than one level of protective treatment; unless the contract directs otherwise, the level designated *NORMAL* shall be applied.

2.1.2 More than one preservative agent may be used provided they are mutually compatible and acceptable to the buyer. In cases where more than one preservative agent is used, methods of test shall be as agreed between the buyer and the supplier.

2.1.3 In contracts where additional treatments other than preservation, for example, water repellency, dyeing, stitch finishing, etc, are specified, the general and special requirements of this standard shall apply in full, unless otherwise stated in the contracts.

2.1.4 When a water repellent is to be simultaneously or subsequently applied, care should be exercised in selecting those emulsions or emulsifying methods which do not impair the degree of water repellency finally desired.

2.2 Physical Properties of Treated Textiles

2.2.1 The physical properties of the textiles, other than mass, which are defined by a relevant material specification, shall still comply with that specification after treatment unless change in these properties is permitted in the contract.

NOTE — Some treatments, for example, wax and dry chemical water repellent processing of 'heavy textile fabrics' may show an apparent reduction of approximately 10 percent in tensile and tear strength from the untreated state.

2.3 Freedom from Impurities

2.3.1 The pH of an aqueous extract of the treated textile shall not be less than 5 and greater than 8 when tested by the method prescribed in IS : 1390-1983*.

*Methods for determination of pH value of aqueous extracts of textile materials (first revision).

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2.3.2 The treated textile shall contain not more than 0.10 percent water soluble chlorides, calculated as NaCl, and not more than 0.25 percent water soluble sulphates, calculated as Na₂SO₄ when tested by the methods prescribed in IS : 4202-1967* and IS : 4203-1967†, respectively.

3. REAGENTS AND CHEMICALS

3.1 Quality of Reagents and Chemicals — The reagents and chemicals used in various processes shall be pure.

NOTE — Pure chemicals shall mean chemicals of such quality that do not affect the final results desired and that the treated textiles conform with the impurity limits stipulated in this standard.

4. PRESERVATIVE AGENTS — METHODS OF APPLICATION AND LEVELS OF PRESERVATIVE CONTENT — CLASS A PROCESSES

4.1 Zinc Naphthenate Process

4.1.1 Preservative Agent — The preservative agent shall consist of zinc naphthenate.

4.1.2 Application — The process shall consist of an even and thorough impregnation of the textile with either:

- a) a solution of the agent in a solvent, or
- b) an emulsion of the agent.

This shall be followed by removal of excess and subsequent thorough removal of solvent or water. The treated textile shall be dry in handling and non-tacky.

4.1.3 Amount of Preservative Agent — The zinc content of the treated textile shall be not less than 0.8 percent and not more than 1.2 percent (calculated as Zn) when tested by the method prescribed in IS : 1039-1956‡.

4.2 Copper Naphthenate Process

4.2.1 Preservative Agent — The preservative agent shall consist of copper naphthenate which complies with the requirements of IS : 1078-1973§.

4.2.2 Application — The process shall consist of an even and thorough impregnation of the textile with either:

- a) a solvent solution of the agent, or
- b) an emulsion of the agent.

*Method for determination of chloride content of textile materials.

†Method for determination of sulphate content in textile materials.

‡Methods for estimation of small quantities of copper, iron, manganese, chromium and zinc in proofed cotton fabrics (tentative).

§Specification for copper naphthenate (first revision).

This shall be followed by removal of the excess and subsequent thorough removal of solvent or water. The treated textile shall be dry in handling and non-tacky.

NOTE — In case of simultaneous or subsequent water repellent treatment, care should be exercised in selection of emulsions or emulsifying methods to be used which do not impair the degree of water repellency finally desired

4.2.3 Amount of Preservative Agent — The copper content of the treated textile shall be not less than 0.5 percent nor more than 1.2 percent (calculated as Cu) when tested by the method prescribed in IS : 1039-1956*

4.3 Cuprammonium Process

4.3.1 The cuprammonium complex may be prepared generally by two methods.

4.3.1.1 Cuprammonium hydroxide or CA finish

- a) The preservative agent shall be obtained by dissolving copper in ammonia solution in the presence of air, or by dissolving cupric hydroxide in ammonia solution.
- b) According to the copper concentration, these liquors may gelatinize the surface layers of cellulosic textiles as well as depositing the cuprammonium complex to yield finishes in which the copper is well bound.

4.3.1.2 Cuprammonium salts — Cuprammonium salts shall be prepared by adding excess ammonia liquor to solutions of copper salts. Such solutions may have little or no gelatinizing power and unless carefully made, and carefully applied, may yield finishes in which the copper is not particularly well bound. Ammonium salts are also deposited with the cuprammonium complex and may prove chemically adverse subsequently.

4.3.2 Application — The process shall consist of an even and thorough impregnation of the textile with the preservative liquor at room temperature followed by removal of excess and subsequent careful drying. Subsequent washing may be required where cuprammonium salts are used. To comply with the requirements of 2.3 washing is not necessary subsequent to the application of cuprammonium hydroxide (CA).

4.3.3 Amount of Preservative Agent — The amount of preservative agent shall be as follows:

- a) *Normal process* — The copper content of the treated textile shall not be less than 1.0 percent nor more than 1.5 percent (calculated as Cu) when tested by the method prescribed in IS : 1039-1956*.

*Methods for estimation of small quantities of copper, iron, manganese, chromium and zinc in proofed cotton fabrics (tentative).

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- b) *Special process* — The copper content of the treated textile shall be not less than 0.5 percent nor more than 1.0 percent when calculated as Cu. This treatment is suitable where subsequent finishes are applied which are to contain preservative agents.

4.4 Mineral Khaki Process

4.4.1 Preservative Agent — The preservative agent shall consist of a mixture of insoluble hydrated oxides of iron and chromium.

4.4.2 Application — The process shall consist of an even and thorough impregnation of the textile with a solution of iron and chromium salts followed by removal of excess solution. Deposition of the insoluble hydrated oxide is effected by drying and immersing in an alkaline solution (sodium hydroxide solution), followed by thorough washing out of soluble by-products and of excess alkali and then drying.

4.4.3 Amount of Preservative Agent — The amount of preservative agent shall be as follows.

- a) *Normal process* — The iron content of the treated textile shall be not less than 0.7 percent nor more than 2.9 percent when calculated as Fe_2O_3 . The chromium content shall be not less than 0.6 percent nor greater than 2.9 percent when calculated as Cr_2O_3 .
- b) *Heavy process* — The iron and chromium content of the treated textile shall be not less than 2.9 percent each, when calculated as Fe_2O_3 and Cr_2O_3 respectively.

4.4.3.1 The iron and chromium content of the treated textile shall be calculated by the method prescribed in IS 4655-1968*.

4.4.4 Colour of the Treated Textile — The colour of the treated textile shall match a colour to be agreed between the contracting parties.

4.4.5 Freedom from Impurities — The water soluble chromium content (expressed as $\text{K}_2\text{Cr}_2\text{O}_7$) shall not exceed 0.03 percent when tested by the method prescribed in IS : 5449-1969† and the water soluble iron content shall not exceed 0.015 percent (calculated as Fe_2O_3) when tested by the method prescribed in Appendix B.

4.5 Chrome Tinting Process

4.5.1 Preservative Agent — The preservative agent shall consist of insoluble hydrated chromium oxide.

*Method for determination of iron and chromium in textiles.

†Methods for determination of water soluble chromate in textile materials.

4.5.2 Application — The process shall consist of an even and thorough impregnation of the textile with a salt of a chromium solution followed by removal of excess. Formation of the insoluble compound within the textile is then effected by immersion in an alkaline solution followed by thorough washing out of soluble substances and of excess alkali and then subsequent drying.

4.5.3 Amount of Preservative Agent — The chromium content of the treated textile shall be not less than 1.0 percent nor more than 1.5 percent (calculated as Cr_2O_3) when tested by the method prescribed in IS : 4655-1968*.

4.5.4 Freedom from Impurities — The total soluble chromium content (expressed as $\text{K}_2\text{Cr}_2\text{O}_7$) shall not exceed 0.03 percent when tested by the method prescribed in IS : 5449-1969†.

4.6 Salicylanilide Process

4.6.1 Preservative Agent — The preservative agent shall consist of salicylanilide.

4.6.2 Application — The process shall consist of an even and thorough impregnation of the textile with a suitable solution or dispersion of the agent and removal of excess, followed by careful drying. The salicylanilide finally present shall be substantially insoluble in water. Salicylanilide is soluble in dilute ammonia solution from which the insoluble agent is deposited by evaporating off the ammonia and water. When solubilized with sodium carbonate or hydroxide, it becomes necessary to precipitate the agent subsequently by immersion in dilute acid or acid salt solution, followed by adequate washing to remove water soluble substances, and then drying. Only when required by contract or order, shall a wax emulsion be applied, either added to the salicylanilide bath or else as a final treatment.

4.6.3 Amount of Preservative Agent — The salicylanilide content of the treated textile shall be not less than 0.1 percent nor more than 0.4 percent when tested by the method prescribed in IS : 3522 (Part 1)-1966‡.

4.7 Pentachlorophenyl Laurate (PCPL) Process

4.7.1 Preservative Agent — The preservative agent shall be pentachlorophenyl laurate with a maximum free pentachlorophenyl content of 5 percent.

*Method for determination of iron and chromium in textiles.

†Methods for determination of water soluble chromate in textile materials.

‡Method for estimation of common preservatives used in textile industry, Part 1.

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4.7.2 Application — The process shall consist of an even and thorough impregnation of the textile with either:

- a) a solvent solution of agent, or
- b) an aqueous emulsion of the agent.

This shall be followed by removal of excess and subsequent drying or thorough solvent removal. The treated textile shall be dry in handling and non-tacky.

4.7.3 Amount of Preservative Agent

- a) *Light process* — The pentachlorophenyl laurate content of treated textile shall be not less than 1.0 percent nor more than 1.7 percent when tested by the method prescribed in Appendix C.
- b) *Normal process* — The pentachlorophenyl laurate content of the treated textile shall be not less than 1.7 percent nor more than 2.5 percent (*see* Appendix C) unless the textile being treated is sewing thread or pressed wool felt in which case the upper limit shall be 3.5 percent.
- c) *Pentachlorophenyl (PCP) content* — In neither case shall the free PCP content of the treated textile exceed 10 percent of the pentachlorophenyl laurate content.

4.8 Copper 8 Process

4.8.1 Preservative Agent — The preservative agent shall consist of copper 8 hydroxyquinolin.

4.8.2 Application — The process shall consist of an even and thorough impregnation of the textile with either of the following.

- a) a solvent solution of solubilized copper 8, followed by removal of excess and evaporation of the solvent; or
- b) an emulsion of a solvent solution of solubilized copper 8, followed by removal of excess and evaporation of the solvent and water, or
- c) first an acidified aqueous solution of 8 hydroxyquinolin then, after removal of excess, an aqueous solution of a copper salt to form insoluble copper 8 in the textile. Thereafter thorough washing to remove all water soluble matter (for example, excess acidity or water soluble copper) and subsequent drying; or
- d) a finely dispersed form of the agent in solvent or water followed by removal of excess and subsequent drying. The treated textile shall be dry in handling and free from organic solvents.

4.8.3 Amount of Preservative Agents — The amount of preservative agent shall be as follows:

- a) *Light process* — The copper content of the treated textile shall be not less than 0.03 percent nor more than 0.049 percent when calculated as Cu.
- b) *Normal process* — The copper content of the treated textile shall be not less than 0.050 percent nor more than 0.119 percent when calculated as Cu.
- c) *Heavy process* — The copper content of the treated textile shall be not less than 0.120 percent when calculated as Cu.

4.8.3.1 The copper content of the treated textile shall be calculated by the method prescribed in Appendix D.

4.8.4 Freedom from Impurities — The water soluble copper content of the treated textile shall not exceed 0.005 percent (calculated as Cu) when tested by the method prescribed in Appendix B

4.9 Dichlorophen Process

4.9.1 Preservative Agent — The preservative agent shall be dichlorophen.

4.9.2 Application — The process shall consist of an even and thorough impregnation with either of the following:

- a) a solvent solution of the agent, followed by removal of excess and evaporation of the solvent; or
- b) an aqueous suspension of the agent, followed by removal of excess and subsequent drying; or
- c) an aqueous solution of the sodium salt of the agent, then removal of excess followed by immersion in an acid fixing bath and thorough rinsing where appropriate. Where pH of the textile after the sodium salt treatment is within 5.5 to 7.0, no subsequent acid fixation is required.

The treated textile shall be dry in handling and free from organic solvents.

4.9.3 Amount of Preservative Agent — The amount of preservative agent shall be as follows:

- a) *Normal process* — The amount of dichlorophen present on the treated textile shall be not less than 0.6 percent nor more than 1.3 percent.
- b) *Heavy process* — The amount of dichlorophen present on the treated textile shall be not less than 1.3 percent nor more than 2.0 percent

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4.9.3.1 The amount of dichlorophen in the treated textile shall be determined by the method prescribed in IS : 3522 (Part 3)-1983*.

4.10 Tar Oil Process

4.10.1 Preservative Agent — The preservative agent shall consist of a tar oil containing not less than 20 percent of phenols.

4.10.2 Application — The process shall consist of an even and thorough impregnation of the textile with either

- a) the tar oil followed by removal of excess; or
- b) an emulsion of the tar oil, followed by removal of excess and fixation of the agent in the textile

The treated textile shall be dry in handling and non-tacky.

4.10.3 Amount of Preservative Agent — The amount of preservative agent shall be as follows:

- a) *Normal process* — The phenols content of the treated textile shall be not less than 2.5 percent nor more than 5.0 percent.
- b) *Heavy process* — The phenols content of the treated textile shall be not less than 5.0 percent and not more oil than is consistent with the requirements of the dryness and freedom from tackiness.

4.10.3.1 The phenol content of the treated textile shall be determined by the method prescribed in IS : 3522 (Part 3)-1983*.

4.11 Dieldrin Process

4.11.1 Preservative Agent — The preservative agent shall consist of dieldrin which denotes the products containing 85 percent (*m/m*) of the insecticide.

4.11.2 Application — The process shall consist of an even and thorough impregnation of the textile at elevated temperature with a suitable aqueous dispersion of the agent under conditions that promote a high degree of substantivity of the agent on the fabric.

NOTE — The use of aerosol method of application does not comply with the requirements of this standard

4.11.3 Amount of Preservative Agent — The dieldrin content of the treated textile shall be not less than 0.02 percent nor more than 0.1 percent when tested by the method prescribed in IS : 3522 (Part 2)-1970†.

*Methods for estimation of common preservatives used in textile industry, Part 3.

†Methods for estimation of common preservatives used in textile industry, Part 2.

4.12 Halogenated Diphenyl Urea Derivative (HDUD) Process

4.12.1 Preservative Agent — The preservative agent shall consist of a halogenated diphenyl urea derivative which is defined as a mothproofing agent containing 5 chloro-2-(2-sulpho-4-chlorophenoxy)-3', 4'-dichlor, NN' diphenyl urea.

4.12.2 Application — The process shall consist of an even and thorough impregnation of the textile with an aqueous solution of the agent under conditions that promote a high degree of substantivity of the agent on to the fabric.

4.12.3 Amount of Preservative Agent — The amount of preservative agent shall be as follows

- a) *Normal process* — The HDUD content of the treated animal fibres shall be not less than 0.56 percent and not more than 0.79 percent when calculated by the method prescribed in IS : 3522 (Part 3)-1983*
- b) *Heavy process* — The HDUD content of the treated animal fibres shall be not less than 0.80 percent. This amount of agent is suitable for wool clothes likely to be subjected to extensive washing and with a high milling requirement, for example, uniforms.

5. PRESERVATIVE AGENTS — METHODS OF APPLICATION AND LEVELS OF PRESERVATIVE CONTENT — CLASS B PROCESSES

5.1 Tributyltin Oxide Process

5.1.1 Preservative Agent — The preservative agent shall consist essentially of di (tributyltin) oxide

5.1.2 Application — The process shall consist of an even and thorough impregnation of the textile with either

- a) a solvent solution of the agent, or
- b) an emulsion of the agent.

This shall be followed by removal of excess and subsequent drying or thorough removal of solvent. The treated textile shall be dry in handling.

5.1.3 Amount of Preservative Agent — The amount of preservative agent shall be as follows:

- a) *Light process* — The tin content of the treated textile shall be not less than 0.01 percent nor more than 0.02 percent when calculated as Sn

*Methods for estimation of common preservatives used in textile industry, Part 3.

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- b) *Normal process* — The tin content of the treated textile shall be not less than 0.08 percent nor more than 0.16 percent when calculated as Sn.

5.1.3.1 The tin content of the treated textile shall be determined by the method prescribed in IS : 3522 (Part 3)-1983*.

5.2 OPP Process

5.2.1 Preservative Agent — The preservative agent shall be *o*-phenyl-phenol.

5.2.2 Application — The process shall consist of an even and thorough impregnation of the textile with either.

- a) a solvent solution of the agent followed by removal of excess and subsequent evaporation of the solvent; or
- b) an aqueous solution of the sodium salt of the agent followed by removal of excess, then immersion in an acid or acid salt bath and subsequent rinsing where required, and careful drying.

The treated textile shall be dry in handling and substantially free from organic solvent.

5.2.3 Amount of Preservative Agent — The amount of preservative agent shall be not less than 0.5 percent when tested by the method prescribed in IS : 3522 (Part 3)-1983*.

5.3 Pentachlorophenol Process

5.3.1 Preservative Agent — The preservative agent shall be pentachlorophenol.

5.3.2 Application — The process shall consist of an even and thorough impregnation of the textile with either.

- a) a solvent solution of the agent, followed by removal of excess and subsequent evaporation of the solvent, or
- b) an aqueous solution of the sodium salt of the agent followed by removal of excess and then immersion in an acid or acid salt bath followed by thorough rinsing, where required, and careful drying, or
- c) an acid dispersion of the agent in water, followed by removal of excess and subsequent drying (specially suitable for wool).

5.3.3 Amount of Preservative Agent — The amount of preservative agent in the treated textile shall be not less than 0.5 percent nor more than 1.5 percent when tested by the method prescribed in IS : 3522 (Part 1)-1966†.

*Methods for estimation of common preservatives used in textile industry, Part 3.

†Method for estimation of common preservatives used in textile industry, Part 1.

6. PACKING AND MARKING

6.1 Packing — The yarns shall be packed in bundles and fabric in pieces of suitable size and mass as agreed to between the buyer and the seller. Each bundle or piece shall be covered with polyethylene sheets suitably secured.

6.2 Marking — The bundles or pieces shall be marked with following informations or as required by the buyer using suitable inks:

- a) Nature, type and quality of the textile material;
- b) Name of the preservative treatment given;
- c) Method of application of the preservative agent;
- d) The name of the process, that is, light, normal, heavy or special; and
- e) Name of manufacturer, batch number, date of manufacture, etc.

6.2.1 Each bundle may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7. SAMPLING

7.1 Lot — The quantity of textile material of one definite type and quality delivered to one buyer against one despatch note shall constitute a lot.

7.2 Unless otherwise agreed to between the buyer and the seller, the number of bundles or pieces to be selected at random from a lot shall be in accordance with Table 1 or Table 2, respectively.

7.3 From each bundle of yarn or piece of fabric selected as in 7.2, cut out small portions each weighing about 25 g from at least two different parts and mix them. This shall constitute the test sample. While taking the sample, care shall be taken to exclude a sufficient length of yarn or fabrics from both the ends.

TABLE 1 SAMPLE SIZE FOR YARN

(Clauses 7.2 and 7.3)

LOT SIZE (NUMBER OF BUNDLES IN THE LOT)	SAMPLE SIZE (NUMBER OF BUNDLES TO BE SELECTED)
<i>N</i>	<i>n</i>
Up to 150	3
151 " 300	4
301 " 500	5
501 " 1 000	7
1 001 " 3 000	8
3 001 " 10 000	9
10 001 and above	10

TABLE 2 SAMPLE SIZE FOR FABRICS

(Clauses 7.2 and 7.3)

LOT SIZE (NUMBER OF PIECES IN THE LOT)	SAMPLE SIZE (NUMBER OF PIECES TO BE SELECTED)
<i>N</i>	<i>n</i>
Up to 100	2
101 " 150	3
151 " 300	4
301 " 500	5
501 " 1 000	7

8. CRITERIA FOR CONFORMITY

8.1 The lot shall be considered conforming to this standard when the following requirements are fulfilled:

- a) The change in the physical properties except mass of the treated textile which are defined by the relevant material specification is as per the contract or the order.
- b) The average pH of the aqueous extract of the treated textile lies between 5 and 8.

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- c) The average content of water soluble chlorides calculated as NaCl is not more than 0.10 percent.
- d) The average content of water soluble sulphates calculated as Na_2SO_4 is not more than 0.25 percent.
- e) The preservative agent used is as mentioned in the specification and meets the requirements wherever specified.
- f) Average amount of the preservative agent on the treated textile is as per the requirements laid down in the specification.
- g) The process followed is as laid down in the specification.
- h) Solvent soluble matter wherever applicable is as per the specification.
- j) The impurities like water soluble chromium, iron, etc, meet the requirements of the specification wherever applicable.

APPENDIX A

(*Clauses 0.4 and 0.5*)

TEXTILE PRESERVATIVE PROCESSES

A-1. Preservative processes are not necessarily interchangeable since some confer biological resistance whereas others protect the textile against sunlight attack. Furthermore the processes differ in the extent to which they modify the chemical and physical properties of the textile.

A-2. Other factors to be noted while selecting any preservative treatment are the colour it may impart, its odour and effect on fabric handle; the degree of protection against insects, its effect on rubber, plastics and light alloys in contact, and the extent to which the preservative may be leached out in wet conditions or be lost by volatility. The choice depends upon the basic nature of the textile and the hazards expected in use of the preservative.

A-3. The following list and Table 3 give general guidelines for the selection of a preservative treatment but care should be exercised in their interpretation for any particular application.

Some Known and Suggested Uses of Textile Preservative Agents

<i>Class A Agent</i>	<i>Uses</i>
1. Zinc naphthenate	Ropes, cordage, convasses, ducks of cotton and flax, sewing threads.
2. Copper naphthenate	Jute hessians, hemp sackings, needle loom felts, ropes, cordage, cotton and flax convasses, ducks, covers, tarpaulins tentage, webbings and netting.
3. Cuprammonium hydroxide and cuprammonium salt	Largely for cotton and flax fabric either alone or as a preparation for subsequent waterproofing or flame-proofing processes for covers and tarpaulins. May also be used for rotproofing jute tarpaulin fabrics, pressed felts, etc, for which the cuprammonium salt process is also commonly used.
4. Mineral khaki	Cotton and flax either alone or in conjunction with vat dyestuffs and various waterproofing finishes, tarpaulins, covers, and tentage especially for tropical use.

<i>Class A Agent</i>	<i>Uses</i>
5. Salicylanilide	Mainly on scoured and bleached cotton and flax textiles for protection in store, mosquito netting, cotton yarns for electrical purposes.
6. Pentachlorophenyl Laurate (PCPL)	Cotton, flax, jute fabrics used as covers, canvasses, tarpaulins, awnings, shop blinds, tentage, etc, either alone or incorporated in water and other proofing treatments. Also used in pressed felts, woollen fabrics, carpet backings, ropes, cordage, sacks, sewing threads, coated fabrics, mosquito covers, covers, coated fabrics, mosquito nets, nettings and textiles for aeronautical applications.
7. Dichlorophen	Similar to PCPL.
8. Copper 8	Heavy canvasses and tarpaulins, tentage, ducks of cotton and flax, cordages, ropes and nets.
9. Tar oils	Jute fabrics, sacks, cordages, ropes and nets.
10. Dieldrin	For the working life protection of wool and other animal fibres and their blends from moth and beetle damage during storage and use.
11. HDUD	For the working life protection of wool and other animal fibres and their blends from moth and beetle damage during storage and use.

Class B

a) Tributyltin oxide (TBTO)	For protection of textiles in store and as for PCPL.
b) o-phenylphenol (OPP)	For protection of textiles in store and for temporary protection in outside use.
c) Pentachlorophenol (PCP)	PCP is also used for the protection of wool textiles.

TABLE 3 GUIDE TO SELECTION OF PROCESSES
(*Clauses 0.4 and 0.5*)

AGENT	APPLICATION	MICROBIAL RESISTANCE IMPARTED	EFFECT OF STRONG SUNLIGHT	RESISTANCE TO LEACHING	COLOUR IMPARTED	ODOUR	EFFECT ON HANDLE	GENERAL COMMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Zinc naphthe- nate	Solvent or aqueous dis- persion	Fair to medium	Nil	Fair to good	None	Initially slip- ightly unplea- sant, soon lost on weathering	Greasy to sticky according to amount	Not suitable for contact with unprotected foodstuffs
Copper naphthe- nate	Solvent or aqueous dispersion	High	Usually aug- ments attack but may be a protective for jute. Colour fades	Fairly good	Green/ blue	Initially slight- ly unpleasant, soon lost on weathering	Greasy to sticky according to amount	Not suitable for contact with unprotected foodstuffs, or contact with rubber and light alloys
Cupram- monium hydroxide	Aqueous solution	High	As for copper naphthenate	Fairly good	Green	Nil	Smooth and lustrous on cotton and flax. Fabric may be slight- ly stiffened. Not greasy	As for copper naphthenate
Cupram- monium salts	Aqueous solution	High	As for copper naphthenate	Fair	Green	Nil	Non-greasy, little or non- stiffening	As for copper naphthenate
Mineral khaki	Two bath aque- ous solutions	Low	Excellent resi- tance, lightfast	Excellent	Khaki	Nil	Brittle unless wax finish	—
Chrome tinting	Two bath aque- ous solutions	Low	Some retarding effect, lightfast	Good	Pale green	Nil	Brittle unless wax finish	—

Salicyl-anilide	Solvent or aqueous dispersion or solution	Only moderate for short term and interior work	Augments attack and turns yellow loosing microbial efficacy	Poor	None initially	Nil	Nil	—
Pentachlorophenyl laurate (PCPL)	Solvent or solution or emulsion	High	Augments attack	Fairly good	None	Slight	Nil	—
Copper 8	Solvent or aqueous dispersion or solution	High	Retards attack, changes colour to brown	Good	Yellow green to brownish	Slight	Nil	Not suitable for contact with unprotected foodstuffs. Not suitable for PVC
Dichlorophen	Solvent or aqueous dispersion or solution	High	Augments attack and turns brown	Fairly good	None	Slight	Nil	—
Tar oil	By itself or as an aqueous dispersion	High	Augments attack	Good, even in sea water	Brown	Distinct	Greasy	Avoid skin contact
Dieldrin	Aqueous dispersion at elevated temperature	Nil	Nil	Good	None	Nil	Nil	Not recommended for use on textile intended for underwear. Suitable for moth and/or beetle proofing on all types of wool and animal hair

(Continued)

TABLE 3 GUIDE TO SELECTION OF PROCESSES — *Contd*

AGENT	APPLICATION	MICROBIAL RESISTANCE IMPARTED	EFFECT OF STRONG SUNLIGHT	RESISTANCE TO LEACHING	COLOUR IMPARTED	ODOUR	EFFECT ON HANDLE	GENERAL COMMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HDUD	Aqueous solution or dispersion under neutral to strongly acid solutions	Nil	Nil	Good	None	Nil	Nil	Suitable for moth and/or beetle proofing on all types of wool and animal hair
Tributyltin oxide	Solvent or aqueous dispersion	High	Loses efficacy, may enhance attack	Good	None initially	Slight	Nil	—
OPP	Solvent or water dispersion or only solution	Good but short term only	—	Poor, volatile also	None	Slight	Nil	—
Pentachlorophenol	Solvent or water dispersion or only solution	High but short term only	Augments attack	Poor to moderate, volatile also	None	Slight	Nil	May be skin irritant. Not safe for contact with foodstuffs

NOTE — Most preservative processes or chemicals may have toxic properties in some measure, and should be handled with care. Detailed information can be had from the manufacturer of the agent.

APPENDIX B

(Clauses 4.4.5 and 4.8.4)

ESTIMATION OF WATER SOLUBLE COPPER AND IRON CONTENT IN TEXTILE MATERIALS

B-1. PREPARATION OF WATER EXTRACT

B-1.1 Prepare the water extract of the conditioned test specimen as given under 6.3.1 of IS : 5449-1969*.

B-2. DETERMINATION OF WATER SOLUBLE IRON

B-2.1 Determine the percentage of iron as its oxide (Fe_2O_3) in the water extract of the sample (*see* B-1.1) by the method prescribed under 8.6.2 of IS : 4655-1968†.

B-3. DETERMINATION OF WATER SOLUBLE COPPER

B-3.1 Prepare a water extract of the sample under test as given in B-1.1.

B-3.2 Determine the copper content in the water extract of the sample (*see* B-3.1) by the method prescribed under 5 of IS : 7212-1974‡.

APPENDIX C

(Clause 4.7.3)

DETERMINATION OF PENTACHLOROPHENYL LAURATE (PCPL) CONTENT

C-1. GENERAL

C-1.1 The method is applicable to the determination of PCPL in the absence of added pentachlorophenol. The proofing is hydrolyzed, acidified and steam distilled and the pentachlorophenol in the distillate extracted with 1, 1, 1 trichloroethane and complexed with copper sulphate pyridine reagent. The optical density of the complex in 1, 1, 1 trichloroethane is measured on a suitable spectrophotometer at 450 nm.

C-2. REAGENTS

C-2.1 Ethanediol (Ethylene Glycol)

C-2.2 1, 1, 1-Trichloroethane

C-2.3 Pyridine (AR, GPR Grade)

C-2.4 Sodium Hydroxide, Pellet

C-2.5 Copper Sulphate Reagent Solution 50 g/l

*Methods for determination of water soluble chromate in textile materials.

†Method for determination of iron and chromium in textiles.

‡Methods of determination of copper.

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C-2.6 Pentachlorophenol (Standard Reagent) Melting Point 188°C Minimum

C-2.7 Hydrochloric Acid, Concentrated 36 Percent (m/m) (11M)

C-2.8 Copper Sulphate — Pyridine Reagent — prepared by mixing 4 ml pyridine with 6 ml copper sulphate solution immediately before use.

C-3. PROCEDURE

C-3.1 Weigh 2.5 ± 0.05 g of the material, cut into small pieces of not more than 5 mm square and place in a dry 250 ml round flask (B24/29 socket). Add 30 ml of ethanediol, 4 g of sodium hydroxide (pellet form), 2-4 ml of water, in that order and a few anti-bumping granules. Connect the flask with a double surface condenser, bring the contents to boiling point on a sand bath and boil them vigorously for 30 min under reflux. After this allow the contents of the flask to cool, remove the reflux condenser and add through a funnel 60 ml water followed by 20 ml hydrochloric acid. Steam distil the contents of the flask ensuring that a constant volume is maintained by applying gentle heat as necessary. Collect 300 ml of distillate in a suitable receiver, applying care to prevent loss of pentachlorophenol in the distillate by adequate cooling. Discontinue the external heating of the flask a few minutes before disconnecting the steam supply. Disconnect the condenser and fit it vertically over the distillate receiver. Wash down the condenser with 25 to 30 ml of trichloroethane and collect the washing in the distillate. Transfer the distillate and trichloroethane washings to a 500-ml separating funnel and shake thoroughly. Allow the layers of water and trichloroethane to separate completely before running off the trichloroethane layer into a 100 ml separating funnel. Wash the condenser and distillate receiver with a further 25-30 ml trichloroethane and add this to the aqueous solution into the 500-ml separating funnel. Repeat the extraction as given above and add the trichloroethane layer to the first trichloroethane extract in the 100 ml separating funnel. Add to the bulked trichloroethane extract 10 ml of copper sulphate-pyridine reagent (*see C-2.8*) and shake well. After complete separation of the aqueous and trichloroethane layers, run the lower trichloroethane layer into a 100-ml volumetric flask via a small funnel containing anhydrous sodium sulphate supported by means of a quartz wool plug. Add a small quantity of trichloroethane to the copper sulphate-pyridine solution remaining in the separating funnel, shake and allow the layers to separate. Filter the trichloroethane layer through quartz wool plug and collect in the volumetric flask. Wash the filter with further small quantities of trichloroethane and finally make up to 100 ml trichloroethane.

Determine the optical density of the solution using a suitable spectrophotometer at 450 nm using trichloroethane as a blank. Estimate the PCPL content by reference to a calibration graph prepared from known standards of pentachlorophenol (1.0 percent pentachlorophenol = 1.71 percent PCPL).

NOTE — If the proofing is expected to contain both pentachlorophenol and PCPL then the free pentachlorophenol content should be determined as given in IS : 3522 (Part 1)-1966*, and the amount found deduced from the apparent PCPL content.

C-4. CALIBRATION

C-4.1 Direct — Prepare a calibration graph using 5, 10 and 15 ml aliquots of a standard solution of pentachlorophenol reagent (1 g/200 ml) in trichloroethane to cover a range of 1, 2 and 3 percent respectively. Dilute each aliquot to 50-60 ml with trichloroethane, and 10 ml of copper sulphate-pyridine reagent, shake well and then follow the described procedure. Plot optical density against concentration of PCPL.

C-4.2 Indirect — Prepare a calibration graph using 5, 10 and 15 ml aliquots of a standard solution of pentachlorophenol reagent (1 g/200 ml) in dilute sodium hydroxide solution (sufficient for complete solution of pentachlorophenol). Place each aliquot in round bottomed flask, add 60 ml water and 20 ml hydrochloric acid. Fit the flask for steam distillation and then follow the described procedure.

If the distillation technique is satisfactory then the graphs obtained as in **C-4.1** and **C-4.2** should be the same.

A P P E N D I X D

(Clause 4.8.3.1)

DETERMINATION OF COPPER CONTENT IN COPPER 8 HYDROXYQUINOLIN

D-1. GENERAL

D-1.1 The method is applicable where dyestuffs soluble in sulphuric acid or dichloromethane are absent. The copper 8 is extracted from the material by hot extraction with sulphuric acid. The acid solution is neutralized and extracted with dichloromethane and the optical density of dichloromethane solution is measured on a suitable spectrophotometer at 410 nm.

D-2. REAGENTS

D-2.1 Dichloromethane

D-2.2 Sodium Sulphate Anhydrous

D-2.3 Ammonia Solution, 5 M

*Method for estimation of common preservatives used in textile industry, Part 1.

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D-2.4 Sulphuric Acid, 2.5 M

D-2.5 Copper 8 hydroxyquinolin, standard reference reagent prepared by adding excess of a solution of copper sulphate (60 g/l) to 100 ml solution of 8 hydroxyquinolin (50 g/l) in 95 percent (*v/v*) ethanol. Filter off the precipitated copper 8 hydroxyquinolin on a suitable sintered glass filter, wash with water to remove excess copper sulphate. Hot air dry at 90°C for 1 hour. The reagent should be bright yellow in colour and have molar extinction coefficient of not less than 5.2×10^3 .

D-2.6 Copper 8 hydroxyquinolin standard reference solution, prepared by dissolving 1.000 g standard reference reagent in 100 ml dichloromethane.

D-2.7 Bromocresol green indicator solution, 0.4 g/l. Warm 0.1 g bromocresol green with 2.9 ml of 0.05 M sodium hydroxide solution, and 5 ml of 95 percent (*v/v*) ethanol. After dissolution, add 50 ml of 90 percent (*v/v*) ethanol and dilute to 250 ml with water.

D-3. PROCEDURE

D-3.1 Digest on a boiling water bath for 15 min 1.0 g of the finely divided material in a 100 ml beaker with 25 ml of sulphuric acid. Filter the extract through a quartz plug into a 400-ml beaker. Repeat the extraction three times with 25 ml quantities of sulphuric acid filtering each extract through the original quartz wool plug. Cool the bulk solution, add bromocresol green indicator and adjust to $\text{pH } 6 \pm 1$ with ammonia solution added from a burette, cooling the solution from time to time as necessary. Transfer the solution to 500-ml separating funnel and add 200 ml dichloromethane. Shake the funnel for at least 1 min. Allow the contents to separate out, run off the dichloromethane layer through anhydrous sodium sulphate supported on a quartz wool plug directly into a 100-ml graduated flask. Repeat the dichloromethane extraction four times with further 10 ml volumes of dichloromethane, filtering each through the same sodium sulphate plug filter. Bulk the dichloromethane extracts to 100 ml and measure the optical density of the solution on a suitable spectrophotometer at 410 nm using 5 mm cells with dichloromethane as a blank. The calculation of copper 8 hydroxyquinolin can be made from a previously prepared calibration graph (percentage copper content).

D-4. CALIBRATION

D-4.1 Take 0.0, 5.0, 7.5 and 10.0 ml of the standard reference reagent equivalent to 0.0, 0.5, 0.75, and 1.0 percent respectively, place in 100 ml flasks and dilute each to 100 ml with dichloromethane. Determine the optical density of the solution in 5 mm cells at 410 nm using dichloromethane as a blank. Prepare a graph of optical density against percentage of copper 8 hydroxyquinolin.

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